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(54) ## Ornamental transfer specially adapted for adherence to nylon.

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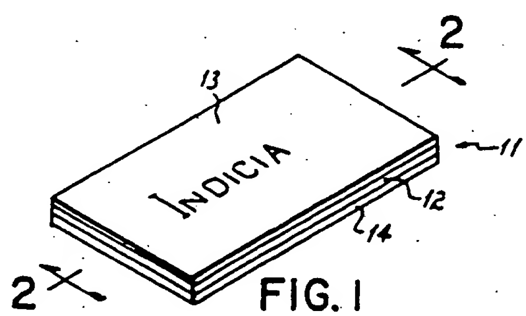

FIG. 1

EP 0 351 079 A3

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EUROPEAN SEARCH REPORT

Application Number

EP 89 30 6333

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	WO-A-7901146 (MEYERCORD) * the whole document *	1-5, 8, 10, 11	D06Q1/14 D06Q1/12
X	US-A-3657060 (HAIGH) * the whole document *	1-5, 8	
Y	GB-A-1447049 (PAYNE) * the whole document *	1, 2, 8, 10	
Y	FR-A-1480860 (BAYER) * the whole document *	1, 2, 8	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D06Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 AUGUST 1990	HELLEMANS W.J.R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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T : theory or principle underlying the invention
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1

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5

ORNAMENTAL TRANSFER SPECIALLY ADAPTED FOR ADHERENCE TO NYLON

This invention r lates to ornam ntal transfers suitable for affixing to cloth or clothing and mor particularly to nylon fabric.

It is well known to apply ornamental transfers to cloth and other substances particularly clothing. Transfers, particularly those which are heat activated, are used, for example, to provide numbers on sports jerseys, names on shirts and company logos on uniforms.

There are several types of heat activated transfers, generally having a heat softenable adhesive layer which bonds to a cloth substrate. A second upper layer may be formed from a variety of different materials including thermoplastics, thermosets, flocks, plastisols, cloth (woven and unwoven) and the like. In other applications, thread in the form of an embroidered letter can form the upper layer with an adhesive layer on the bottom. These are all applied to a substrate by heat and pressure for a period of time sufficient to melt the adhesive layer and permit penetration of the melted adhesive into the surface of a garment.

There are many different known types of transfers. For example, U.S. Patent No. 3,660, 212 discloses a heat activated transfer formed of a polyvinyl chloride lower layer and a surface layer of a cross-linked polyvinyl chloride plastisol. The plastisol is highly pigmented and acts as an ink.

U.S. Patent No. 4,390,387 discloses a flocked transfer with a lower thermoplastic layer. Further, U.S. Patent No. 4,610,904 discloses a heat activated removable ornamental transfer which includes a lower thermoplastic layer and an upper continuous layer of a thermoset material. The upper layer is preferably a thermoset ink. U.S. Patent No. 4,269,885 discloses a heat transfer formed of a polyurethane upper layer bonded to a thermoplastic polyester lower layer.

Embroideries which have a thermoplastic layer are usually formed by stitching thread onto a scrim fabric. The thermoplastic layer is then laminated thereto. This is applied to a garment by applying heat and pressure directly against the threading which in turn heats up the thermoplastic layer allowing it to be applied to a substrate. Further, U.S. Patent Application Serial No. 041,866 entitled "Method of Applying Heat Activated Transfer and Article" filed April 23, 1987 discloses a heat activatable transfer wherein the indicia layer is a discontinuous indicia bearing layer and the thermoplastic layer is a continuous thermoplastic lay r. It is appli d to a garment with blotting pap r between th indicia bearing lay r and the heat source. Heating th blotting paper in turn h ats the thermoplastic material and excess thermoplastic material is absorbed by the blotting paper.

All of th s heat activated transf rs may be applied to a substrate which does not melt during application and to which the adhesive is adherent or coherent. These work for most materials.

Nylon is the very notable exception. Due to its close tight weave it is very difficult for the adhesive to penetrate the weave to form a good bond. Due to the chemical make up of the nylon the generally used adhesives do not adequately wet the surface of the nylon to provide a good adhesive bond. Nor do these adhesives form any chemical bond between the nylon and the adhesive.

The adhesives generally used in heat activated indicia include polyurethanes, polyvinyl chloride, polyolefins such as polyethylene and polyproplene and thermoplastic polyester.

These adhesives generally must be capable of forming a non-tacky film which upon application of heat melts to become tacky. Previously used adhesives for adhering indicia bearing transfers are unsuitable for nylon. This has necessitated in many applications physically sewing the material onto the nylon. This is very expensive and greatly increases the cost of many nylon jackets.

Other nylon materials are simply printed with an ink such as a vinyl plastisol type of ink. This ink generally crumbles off after a period of time and is not capable of withstanding dry cleaning.

In accordance with the invention a heat activated transfer comprises an upper indicia bearing layer bonded to a film, the film comprising a linear saturated polyester incorporating a heat activated curing agent.

Such a heat activated ornamental indicia bearing transfer is suitable for application to nylon and will adhere and remain adhered thereto.

Preferably, the curing agent is an isocyanate and is provided in sufficient amount to at least partly cross-link the polyester causing it to adhere to nylon.

The upper indicia bearing layer may be formed from a variety of different heat resistant materials which are not destroyed at application temperatures. The upper layer generally remains solid at the softening temperature of the adhesive layer, although a thermoplastic urethane which melts at the application temperature but is not destroyed may be used. Preferably the upper layer is a thermoplastic urethane, thermoset plastic material, flock, or wov n material such as twill edge sewn letters (with or without PVC layer), puff ink and embroideries.

A thermoset plastic is a resin which in its final state is substantially infusible and insoluble. Ther-

mosetting resins. often liquid at some stage in their manufacture or process, are cured by heat catalysis or other ch mical means. After being fully cured, thermos ts cannot b resoftened by h at.

Thermos ts include those plastics which are normally thermoplastic but which are made thermosetting by means of cross-linked polyolefins.

Suitable thermoset upper layers include polyamides, thermoset polyurethanes, thermoset polyolefins, thermoset polyepoxides and thermoset polyesters. A preferred thermoset is a thermoset polyurethane ink such as Zephrylon pigmented polyurethanes, sold by Sinclair and Valentine Chemical Coatings Group of Wheelabrator Frye, Inc. of North Kansas City, Missouri. This is disclosed more fully in U.S. Patent No. 4,610,904.

Further the upper indicia bearing layer may be a vinyl plastisol such as disclosed in U.S. Patent No. 3,660,212 or a flock material such as disclosed in U.S. Patent No. 4,390,387. A suitable thermoplastic polyurethane is disclosed in U.S. Patent No. 4,269,885.

Further the upper indicia bearing layer can be a woven material for example cotton. Other nonwoven webs can be used as indicia bearing layers presuming they are not destroyed at application temperatures as described below. Twill, such as edge sewn twill letters, can be the upper indicia bearing layer. Also embroidered letters are suitable.

The adhesive layer is a thermosettable film of a linear saturated polyester polymer which includes a heat activated curing agent. The uncured polyester itself is a linear alkyl polyester formed by reacting a glycol with a diacid. The molecular weight of the uncured polyester must be low enough to flow and wet the surface of the nylon at application temperature, i.e., generally about less than 450 F (232 C). Preferably it should be from 5,000 to 30,000 and most preferably about 10,000 to 15,000. The polyester adhesive should include a heat activated curing agent and preferably a heat activated polyisocyanate curing agent.

Specifically suitable diols include ethylene glycol, propylene glycol, 1,3-propane diol, 1,4-butane diol, 1,5-pentane diol, 1,6-hexane diol, 1,8-octane diol, 1,4-cyclohexanedimethanol, 1,3-cyclohexanedimethanol, diethylene glycol and the like.

Useful diacids for making these polyesters include aromatic dicarboxylic acids having no vinyl saturation such as isophthalic acid, phthalic acid or anhydride, terephthalic acid or aliphatic dicarboxylic acids such as adipic acid, succinic acid, glutaric acid and the like.

The heat activated curing agent acts to cur the polyester upon heating. A heat activated curing agent is preferabl since th ornamental transfers require a shelf lif of several months. The heat activated curing agent can be an isocyanate curing agent preferably a blocked isocyanate curing agent. Suitabl curing agents include phenol blocked methyl ne bis-4-phenylisocyanate such as thos disclosed in U.S. Patent No. 3,307,966 and phenol blocked polyisocyanates such as those discussed in U.S. Patent 3,226,276. Other blocked isocyanates include dimerized toluene diisocyanates and methylethyl-ketoxime blocked polyisocyanates. Methods of forming such polyesters are well known and are disclosed in U.S. Patent Nos. 4,350,807, 3,898,358, 4,606,785 and 4,215,516.

A preferred adhesive for use in the present invention is Bostick adhesive 10-300-3 which is a thermosetting linear saturated polyester adhesive using an isocyanate curing agent and a polyester formed from ethylene glycol and methylterephthalic acid. This is dissolved in methylethyl ketone and methylene chloride and this has a weight average molecular weight of 10-15,000.

Preferably the ornamental transfer can be formed by applying a linear saturated polyester dissolved in an appropriate solvent onto an indicia bearing film, such as polyurethane or the like, allowing the solvent to dissolve leaving a film of the polyester on the indicia bearing layer. The polyester is at least partially thermosettable. This can then be stored for a prolonged period of time.

The transfer is preferably applied to a substrate such as nylon by placing the ornamental transfer onto the substrate with the polyester layer adjacent the substrate and applying heat and pressure sufficient to cause the polyester layer to melt. This heat in turn activates the curing agent. Upon cooling, the polyester solidifies and forms a weak bond to the nylon. The polyester cures or crosslinks over a 24 hour period. The curing of the polyester adjacent the nylon then keeps the ornamental transfer in position.

As will be described hereafter, this can be used in various manners to form many different types of heat activated transfers where the indicia bearing layer can be one of a variety of different substrates.

The invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of an ornamental transfer according to the present invention;

Fig. 2 is a cross-sectional view taken on lines 2-2 of Fig. 1;

Fig. 3 is a perspective view of a different embodiment of the present invention;

Fig. 4 is a perspective view of an other embodiment of the present invention.

As shown in Fig. 1 an ornamental transfer 11 includes a lower polyester layer 12 laminated to an

upper layer 13. An optional release iayer 14 is included adjacent the polyester layer 12.

To form this transfer, the polyest r adhesive, dissolved in a solvent, is coated onto the release layer 14 and dried at about 121-163 C. The upper layer 13 is then film coated onto th polyester layer 12. If the upper layer is a moisture cure polyurethane, the polyurethane is coated onto the solidified polyester layer 12. If the upper layer is thermoplastic, it can be formed into a film and laminated onto the polyester layer 12 before the solvent completely evaporates. The two films can also be laminated together under slight heat and pressure.

As shown in Fig. 3, it is also desirable in certain situations to use an intermediate layer. In this embodiment the polyester layer 15 is coated onto a release layer 16 and the solvent evaporated. A PVC layer 17 can be bonded intermediate the polyester layer 15 and an upper layer 18 which, for example, can be twill or other cloth or even flock. Again, the layers are laminated together under slight heat and pressure.

As shown in Fig. 4 an ornamental transfer can also be made wherein the release sheet 21 is coated with the polyester layer 22 where the polyester layer is a continuous layer. A discontinuous indicia bearing layer such as a discrete letter 23 is then coated onto the polyester layer 22. This is applied to a substrate using blotting paper.

In these applications, various coating methods can be used depending on the particular indicia bearing layer. Preferably, the polyester adhesive is applied, dissolved in a solvent and allowed to dry at a temperature below its curing temperature to dry off the solvent so forming a solid film. The film can also be extruded from solid pellets.

The ornamental transfer is then applied to a substrate, particularly nylon, by placing the polyester layer against the nylon layer, applying heat and pressure against the ornamental transfer, melting the polyester layer and causing it to soak into or migrate towards the nylon. Nylon is the generic name for long chain polyamides which have recurring amide groups as an integral part of the main polymer chain. Generally nylon fabrics are nylon 6/6 which is made by condensing hexamethylenediamine with adipic acid.

The application temperature should be above the cure temperature of the polyester (i.e., activation temperature of the curing agent) generally above 325 F (163 C), suitably around 350-400 F (177-255C). At these temperatures, the polyester film melts and th curing agent is activated. Pressure from the heat source forces the molten polyester to flow into the nylon. This is allowed to cool forming a weak bond with the nylon. Th curing agent then acts to at least partially cure th polyester forming a firm bond to the polyester.

When applied to nylon in this manner the decorative heat transfer remains adhered to the nylon for prolonged periods of tim in spite of washing and other normal use.

To compare the heat activated decorative transfer of the present invention with other heat activated decorative transfers, a heat activated transfer made according to the present invention was formed having a 3 mil thick film of the Bostick-10-300-3 adhesive. Coated over this was one mil of thermoset polyurethane ink made by Zephrylon. This was applied to a piece of nylon fabric at a temperature of 177 C (350 F) for 5 seconds with an applied pressure of about 5 psi (3500kg/m) and allowed to set over a period of 24 hours. After 24 hours, the peel strength of the transfer onto the nylon fabric was 10-14 pounds per square inch (7000-9800 kg/m).

A heat activated decorative transfer made according to the method disclosed in U.S. Patent No. 4,269,885 having a polyurethane thermoplastic upper layer and a thermoplastic polyester lower layer was applied to nylon at 350 F (177 C) for 6 seconds and allowed to set. Its peel strength was less than one pound per square inch (700kg/m). In both of these tests, the nylon was substantially the same and can be described as follows: tightly woven nylon, 150 warp and weave, 2 denier which is typically used for outerwear (windbreakers).

Thus, when using a decorative heat activated transfer according to the present invention, one obtains a very substantial bond between nylon and an indicia bearing layer. The bond strength, 10-14 pounds per square inch (7000-9800kg/m), is considered excellent. Due to the fact that the polyester adhesive can be laminated to a wide variety of different thermoplastic and thermoset materials as well as woven and nonwoven webs made from a variety of different materials including polyesters, cotton and other natural fabrics and wool, it can be used for a wide variety of different applications, provide substantial cost savings and eliminate the need to sew many indicia bearing transfers onto nylon jackets.

The heat activated transfer of the present invention can be used for many applications such as nylon including highly sized garments such as Lycra brand nylon and even clean room garments which are 100% polyester having interwoven carbon fibres to prevent static.

Claims

1. A heat activated transfer comprising an upp r indicia layer (13,18,23) bonded to a film (12,15,22), the film (12,15,22) comprising an un-

cured linear saturated polyest r in combination with a heat activated curing agent.

2. A heat activated transfer as claimed in claim 1 wherein th heat activated curing ag nt is a blocked isocyanate.

3. A heat activated transf r as claim d in claim 1 or 2 wh rein the uncured lin ar saturated polyester has a molecular weight from about 5,000 to about 30,000.

4. A heat activated transfer as claimed in any preceding claim wherein the linear saturated polyester is a reaction product of a glycol and a diacid.

5. A heat activated transfer as claimed in claim 4 wherein the glycol is ethylene glycol and the diacid is terephthalic acid.

6. A heat activated transfer as claimed in any preceding claim wherein the indicia bearing layer (13,18,23) is twill.

7. A heat activated transfer as claimed in claim 6 wherein the twill (18) is bonded to a layer of polyvinyl chloride (17) which is in turn bonded to the linear saturated polyester (15).

8. A heat activated transfer as claimed in any of claims 1-5 wherein the indicia bearing layer (13,18,23) comprises polyurethane.

9. A heat activated transfer as claimed in any of claims 1-5 wherein the indicia layer (23) comprises a discontinuous layer and the film (22) of linear saturated polyester is a continuous film.

10. A heat activated transfer as claimed in any preceding claim wherein the indicia comprises a plurality of different symbols printed onto the film of linear saturated polyester.

11. A heat activated transfer as claimed in any preceding claim wherein the transfer is bonded to nylon.

12. A laminate comprising an upper flexible sheet in combination with a lower nylon layer bonded to said upper flexible sheet by a linear saturated polyester cured with an isocyanate heat activated curing agent wherein said flexible sheet is not molten at a lowest temperature at which the isocyanate heat activated curing agent is activated.

13. The laminate claimed in Claim 12 wherein said flexible sheet is a nonthermoplastic sheet.

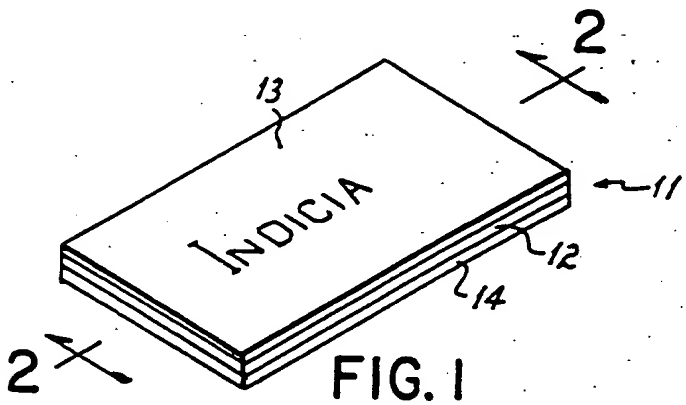

FIG. 1

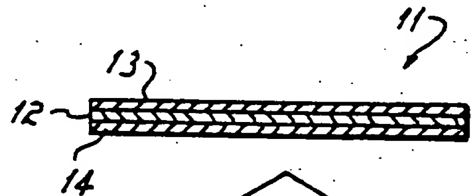

FIG. 2

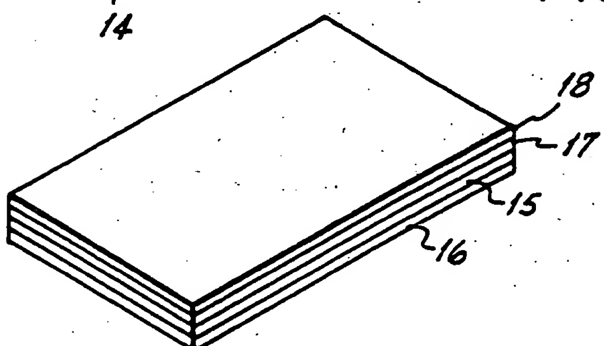

FIG. 3

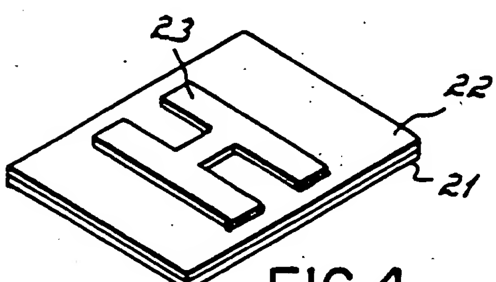

FIG. 4